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Ripe for Retirement: An Economic Analysis of the U.S. Coal Fleet

The U.S. power sector is in a period of unprecedented change, with record numbers of coal plants being announced for retirement. An analysis of which additional coal units are economically vulnerable and should be considered for retirement shows that these uneconomic coal plants can be replaced with affordable alternatives in each region of the country.

Lesley Fleischman, Rachel Cleetus, Jeff Deyette, Steve Clemmer and Steve Frenkel

I. The U.S. Power Sector in Transition

In January 2013, Georgia Power announced that it would retire 10 coal units totaling 1,976 MW, and in September 2013, American Electric Power announced that it would retire the 580 MW coal-fired Tanners Creek Unit 4. These retirement decisions are part of the dramatic transition underway in the U.S. power sector, in which old and inefficient coal units are being retired in favor of cleaner energy sources like natural gas, renewable energy, and energy efficiency. Since 2009, 20.8 GW of coal-fired electricity generation has retired, representing 6.2 percent of U.S.'s 2009 coal fleet, and another 30.7 GW of coal generators is slated for retirement in the near future.[1]

Coal-fired electricity fell from nearly half of U.S. generation in 2008 to 37 percent in 2012. There are many reasons for this decrease in coal-fired generation: an aging and

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inefficient coal fleet, the low cost of natural gas, the falling costs of renewables, slowing growth in electricity demand, rising construction costs for coal plants, and rising coal prices.[2] As a result of these economic factors, the Energy Information Administration's (EIA) latest projections show that very few new coal plants will be built through 2040.[3]

In addition to these market dynamics, state renewable energy and energy efficiency policies have bolstered the economic viability of renewable energy and energy efficiency. There is also an increasing recognition of the need to upgrade coal plant pollution controls to protect public health and address climate change. Coal is one of the most polluting sources of energy, and coal-fired power plants contributed 74 percent of electricity-related carbon dioxide (CO_2) emissions in 2012.[4] Harmful pollutants—such as sulfur dioxide, nitrogen oxides, mercury, and particulate matter—released by burning coal—have been linked to an increase in asthma attacks, heart disease, neurological problems, and premature deaths.

While EPA standards may be hastening and increasing the number of coal plant retirements, it is clear that retirements have been and will continue to be driven by multiple factors. Recent coal plant retirements are part of a long-term trend that started well before EPA began to issue the latest pollution standards.

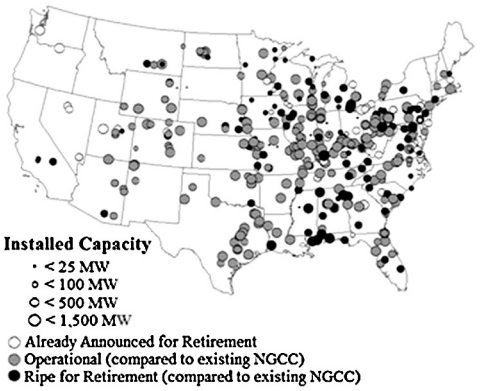

Figure 1: Economic Assessment of U.S. Coal Fleet in 2013 Coal units in the U.S. divided into three categories: those that are currently operating but are already announced for retirement, those that are considered economically competitive in our analysis, and those that are economically vulnerable and thus ripe for retirement.

Numerous recent studies, including *Ripe for Retirement: The Case for Closing America's Costliest Coal Plants*, a 2012 analysis by the Union of Concerned Scientists, have estimated how much additional coal-fired electricity generation may be economically vulnerable.[5] Our research takes an analytic approach to understanding the economic factors driving these changes and identifies which coal units are the most vulnerable (**Figure 1**). We also show that there are several cost-effective options to replace the retiring coal generation and provide policy recommendations that would help enable a transition from coal to cleaner alternatives and address global warming.

II. An Economic Test for Coal-Fired Power Plants

In *Ripe for Retirement*, we examined the economic viability of coal-fired electricity generating units in the United States, providing a snapshot of the economic viability of the U.S. coal fleet based on 2009 data.[6] However, there have been a number of significant changes in the U.S. electricity market since 2009, which called for a fresh analysis. Therefore, in this article, we updated our dataset to reflect 2011 data for the coal fleet (the most recent year available), updated cost and performance assumptions for natural gas and wind, and made some important refinements in our methodology in part to provide more regionally accurate results.

For both the 2012 report and the current analysis, we employ a three-step methodology based on the one developed by Synapse Energy Economics in its 2011 analysis of coal plants in western states.[7] To evaluate the economic competitiveness of coal generators, we compared the cost of electricity from individual coal-fired electricity generating units with the cost of electricity generated from alternatives, including existing natural gas combined cycle (NGCC), new NGCC, and wind. First, we

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